Gas Journal

VOL. 297. 111th YEAR. LONDON, MARCH 11, 1959 No 4991 PRICE 1/6

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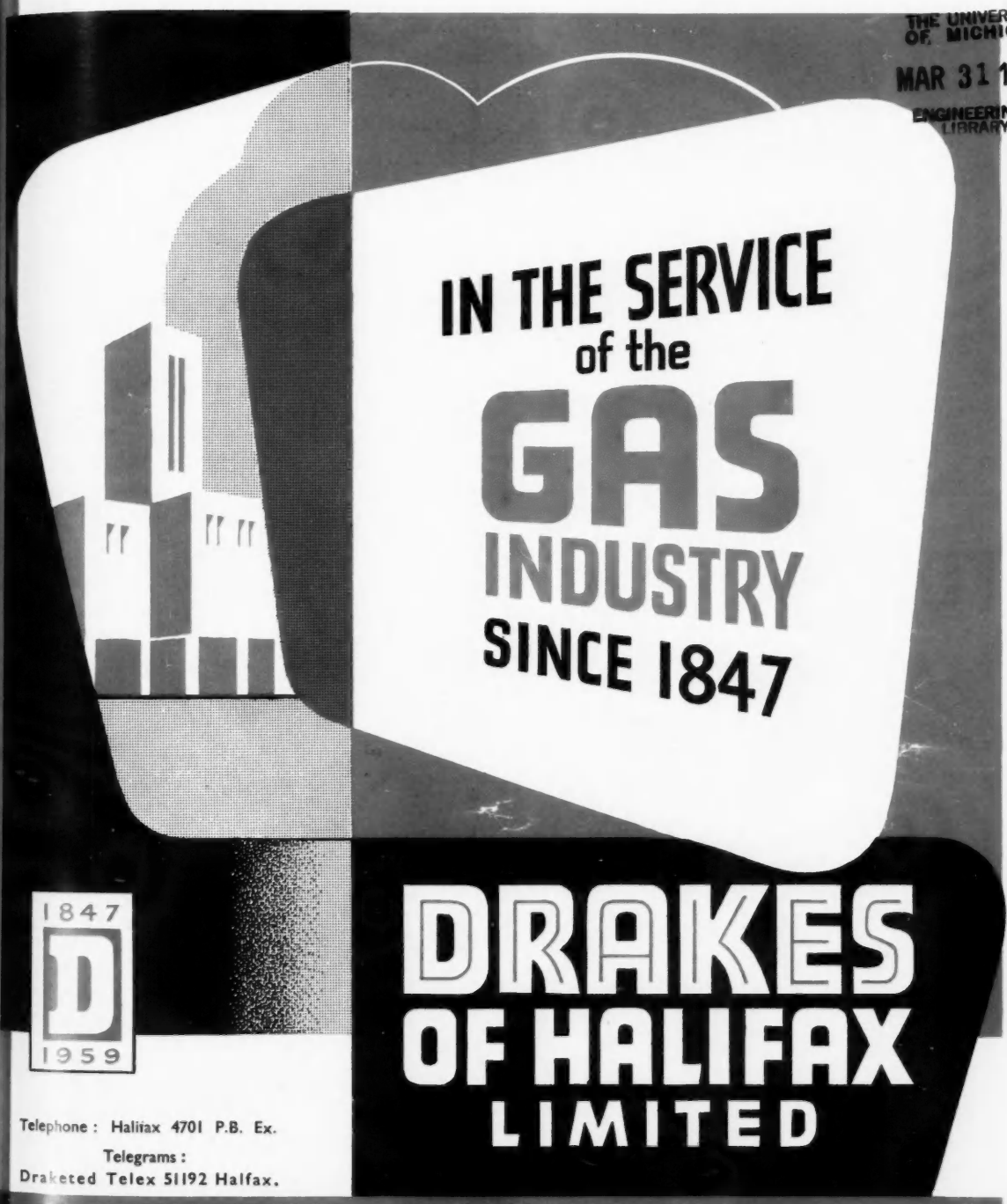

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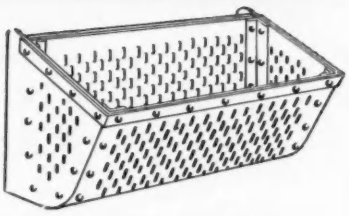

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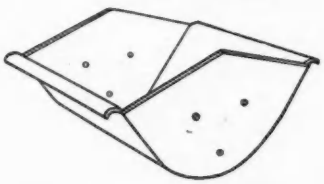

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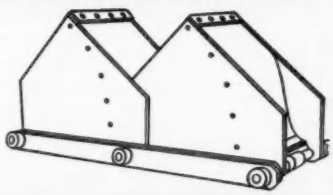

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Gas Journal

VOL. 297 No. 4991 MARCH 11, 1959

111TH YEAR

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Published by Walter King Limited,
11, Bolt Court, Fleet St., London, E.C.4
Telephone: FLEet Street 2236-7 Telegrams:- Gasking, Fleet.

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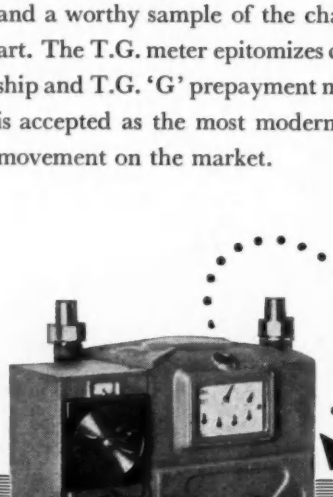
something in common

They remind one of different worlds, the antique chair of 1680-1700 and the modern T.G. meter. Yet they *have* something in common — both are the products of true craftsmanship. The chair, in the style popularly known as 'William and Mary', is attributed to Daniel Marot who designed much of the furniture for Hampton Court Palace. It is presented here as a fine example of furniture design of that period and a worthy sample of the chairmakers' art. The T.G. meter epitomizes craftsmanship and T.G. 'G' prepayment mechanism is accepted as the most modern precision movement on the market.



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Gas Journal

VOLUME 297. No. 4991 MARCH 11, 1959. 111th YEAR

Gas and its Competitors

THE share of the fuel market which the gas industry will be able to command in future is a question continually exercising the minds of those planning its policy. Mr. Wilfrid Bailey, Secretary to the Gas Council, in a paper, 'Gas and the Fuel Market,' read in January to the London and Southern Section of the Institution—but only released for publication last week—sets out in some detail the kind of competition the industry must meet if it is to hold its own with electricity, oil and solid fuel. Much of this is already well known, but Mr. Bailey does well to remind us that the total domestic consumption of gas is as a whole static, in spite of the actual number of such consumers having increased. This has had the effect of reducing the consumption per head from 123 therms to 109 therms per domestic consumer per year. Can this fall be accounted for by the use of more efficient appliances? To a certain extent it may be so, but it seems unlikely that it could possibly account for the whole of such a large drop in demand. The price of gas to this class of consumer has had a much greater effect by deterring any extension of its use for space heating, where oil or electricity may be making greater gains. This tendency is all the more probable when the number of oil heaters in use is found to be about 8 mill., while the cost of oil is equivalent to 1s. 3d. a therm.

The industrial and commercial use of gas has increased since the war, which accounts for the over-all increase in consumption in the post-war period. In the industrial sphere especially, gas must be able to compete in price as well as in other ways with electricity, oil and possibly solid fuels, and any increases in costs of production must be absorbed by more efficient working. The raising of the price would be even more disastrous than in the domestic field. This means that if gas is to remain competitive with electricity and oil in the years to come, the possibility of reducing the costs of its production to about half what they are at present must be taken seriously. It is conceivable that the processes now being developed for gas production by new and unconventional methods may achieve this. If they do, there is likely to be a big demand for a cheap, clean, non-toxic, sulphur-free gaseous fuel.

Mr. Bailey reviews in some detail progress in expansion of electricity sales during the post-war period, and compared to that of gas it is very striking. The number of new consumers connected, the rise in consumption and the rise in price, unfortunately compares favourably with what has happened in the gas industry. It is true that the pattern of consumption is rather different. Industrial consumption of electricity used for both power and heating as well as lighting represents the major proportion, while in the gas industry the domestic load accounts for some 50% of consumption. Extension of rural electricity must account for much of that industry's activities. No such expansion into completely new areas has been contemplated by the gas industry, whose aim has been to retain and improve service to existing rural undertakings. That gas consumption has increased in these places because of better pressure and the availability of up-to-date appliances must, we fear, be treated as incidental.

Mr. Bailey discusses the effect of the advent of nuclear power on the cost of electrical generation. He points out that the cost of power from conventional power stations is made up of capital charges, and fuel and operational charges in the ratio of 1:2. In nuclear power stations this ratio is reversed. For the nuclear power station to compete with the coal- or oil-fired station, it must be used for base load only, and all peak load demands supplied by other stations. Over the next ten years, however, capital charges may fall as engineering techniques improve and the dependence on a good price for the by-product plutonium may become of less importance as new reactors are perfected. This would help the nuclear station to become even more competitive, especially if the cost of conventional fuels increase, as they may very well do. The gas industry is in the more fortunate position that its charges on capital expenditure compare favourably with either type of power station, but its materials account for 46% of its production costs, wages 22%, and other expenses

20% compared to the electricity industry at 37%, 21% and 17% respectively.

The picture drawn so far seems to be one of unrelieved gloom for the gas industry, and everything seems to favour its bitterest rival. The universal, or as far as possible universal, use of electric light has brought the power cable to the individual householder, as well as to office and factory. Once electricity is in, favourable tariffs will encourage household gadgets and fires, and very soon the consumption per consumer will rise. Gas, having lost the lighting load, is less able to offer an equally favourable two-part tariff, and so is unable to expand its existing load so easily.

We do not think that the outlook for gas is quite as black as this. We have often pointed out that the combination of the Clean Air Act and the increasing dislike of household drudgery are beginning to favour the use of refined fuels. Since there is still about 40 mill. tons of solid fuel, equivalent to 5,000 mill. therms of gas, being burned in open fire grates in this country, even a share of this would make a very large difference to the gas industry. Judging by the recent success of the introduction of whole-house heating by gas and the replacement of many solid-fuel grates by convector gas fires, it would seem that a start has already been made. It must, however, be accompanied by a really attractive tariff for gas for space heating and efficient appliances inexpensively installed. Most housewives prefer gas for cooking when given the choice, many would use it for heating hot water and central heating if the price could be reduced.

As Mr. Bailey concludes: 'Improved social conditions and an increased standard of living must lead to an increased domestic use of prepared fuels in substitution for coal. Over the next 30 years, the opportunities offered in this field alone may be such that the present level of total gas sales of 2,680 mill. therms could be doubled, or more than doubled.'

A German Tribute

'THE average German is so impressed by the industrial recovery of Western Germany that he still looks upon British industry with a certain degree of condescension. Great Britain may still be conservative in outlook, but the mere mention of Calder Hall and the Comet should make us think.'

The above introduces a feature article on British gas publicity in the January issue of *Der Gasverkauf* under the title of 'Nationalisation, but No Officialdom.' This suggests that there is much to be learned from the British gas industry, not only technically, but from the point of view of advertising. The Gas Council, with its popular figure of Mr. Therm, is a perfect example of a national advertising policy, states the writer, who goes on to point out that its 12 regional area gas boards do not depend for their advertising on the central office, but can initiate their own local campaigns designed to meet particular local conditions. Taking the East Midlands Gas Board as an example, the article points out that its advertising schedule covers every aspect of advertising from the exact timing of various sales drives to the types of special offers made to the general public, and asks, 'Where could this be matched in Germany?'

The article reports that sales personnel have their own training centre at which, in groups of 15, they learn at two-day courses all there is to know about modern gas heating methods and special tariff rebates, etc.; each sales unit is entitled to a bonus of 1% on salaries for every 2½% over a set yearly sales quota. (It is suggested that possibly even better results would be obtained if this bonus were paid to individuals and not to units.) Reference is made to the further incentive to sales promotion given by the monthly E.M.G.B. periodical 'Talking Shop' which was awarded a first prize by the British Association of Industrial Editors and it is explained that this newspaper also announces all proposed advertising campaigns, and that a series of campaign booklets is issued, designed to encourage sales and to create the right psychological atmosphere among the sales staff.

A campaign geared to city level might appear excessive to individual gas undertakings, states the writer, but points out that in a nationalised industry it represents progress. The campaign is always adaptable to meet the needs of local conditions, he continues. Even the young people are not forgotten as coloured strip comics are included in the Gas Council's publications for the benefit of boys and girls to make them more gas-minded; Mr. Therm has become a familiar national figure to every child.

Liquid Methane at Canvey

THE technical implications and achievement of bringing liquefied natural gas from the Gulf of Mexico to the Thames Estuary was brought into perspective for the gas Press last week, by courtesy of the North Thames Gas Board, who organised a visit. A very high standard of design and workmanship was apparent at the installation; also impressive was the pumping gear of the Methane Pioneer, which could be seen from the jetty discharging the liquefied gas through the heavily insulated pipe-line into the two storage tanks about 1,000 ft. away.

The arrival of this ship with its unique cargo represents the climax of five years' work on a project about which few in this country had any exact technical knowledge. As is well known, the Americans proposed taking such a cargo from the Gulf of Chicago up the Mississippi, using specially designed barges. But this enterprise apparently came to nothing because permission was withheld by the United States Coastguards. It was left to a combined British and American team to work out the details of the ship, to engineers of the North Thames Gas Board to solve the many problems of safe handling and storage of the liquefied gas on arrival, and to a British crew to bring it across the Atlantic. The 'know-how' in the early days was to be found in America and British engineers were struck by the sources of knowledge available there for solving the severe technical problems which were presenting themselves at every turn. What material should be used for the pipe-line and the storage tanks? How were they to be insulated? How should the ships tanks be designed? How should inert conditions of inflammability be maintained on board? Every risk at each stage was calculated, every precaution taken. At Canvey a 'dummy run' with liquid nitrogen provided a most useful means of testing the installation even beyond the strains and stresses expected from the liquefied methane itself.

Concomitant with the technical problems, now basically overcome, is the question of economic practicability, the outcome is as yet unpredictable.

Personal

MR. JAMES SIMPSON, Deputy Chairman of the Woodall-Duckham Construction Co., Ltd., has been appointed Deputy Chairman of Woodall-Duckham Ltd., the parent company of the Woodall-Duckham Group.

MR. W. GAY has been appointed technical representative for Mackay Industrial Equipment Ltd., in the northern counties.

MAJOR M. M. C. NEWEY, of Birmingham, has been appointed part-time member of the West Midlands Gas Board. Major Newey is Chairman and Managing Director of Newey Brothers Ltd., of Birmingham.

MR. J. F. WILLSHER has been appointed General Works Manager of George Kent Ltd. following the retirement from active duty of MR. J. HORRIDGE on medical grounds.

DR. W. I. PUMPHREY has been elected to the Court of Governors of the University of Birmingham as a representative of the Guild of Graduates. Dr. Pumphrey is Manager of the Research Department of Murex Welding Processes, Ltd., Waltham Cross, Herts.

Obituary

MR. LESLIE O'CONNOR, deputy chairman of the Imperial Continental Gas Association, died in a flying accident last week. He was the N.C.B.'s first director of carbonisation, playing a major part in the planning of six new coking plants, including Avenue and Manvers. Later, Mr. O'Connor served as director and deputy chairman of the British Coking Industry Association.

Sir John Stephenson, C.B.E., has been Chairman of the Eastern Gas Board ever since vesting day in 1948 and it has been announced that he is shortly to retire. A small luncheon party was held at the Savoy Hotel in his honour. A group of those present is shown including Sir Donald Perrott, of the United Kingdom Atomic Energy Establishment, Mr. Mervyn Jones, Chairman of the Wales Gas Board, Mr. J. Dyde, Deputy Chairman of the Eastern Gas Board, Mr. Basil Smallpeice, Managing Director of B.O.A.C., Mr. Sydney Smith, Chairman of the Scottish Gas Board, Sir John Stephenson, Mr. H. H. Bates, of Benzol Producers, Ltd., Mr. Norman Smith, Chairman of Smith Meters, Ltd., and Mr. Martin Flett, Deputy Secretary of the Ministry of Power. Mr. Norman Smith presented Sir John with a cake made in the form of a gas meter.

YORKSHIRE AREAS TO BECOME SMOKELESS ZONES

THE first step in a 20-year plan to make the whole of Heckmondwike a smoke-controlled area is to be brought into operation in about 18 months' time. This decision was taken at a special meeting of Heckmondwike Public Health Committee which was called to consider a Ministry of Housing and Local Government circular urging local authorities to draw up smoke control programmes.

Approval of the 20-year phased plan to affect the whole of the town is to be sought at the next council meeting at which it will also be recommended that smokeless fuel should be used in all council properties.

After much criticism of plans to establish a clean-air zone in Goole at the Borough Council meeting recently, a Health Committee minute recommending a smoke control area in principle in the proposed new housing estate in Old Goole, was carried by a majority vote. At a previous meeting the council voted against establishing a clean-air zone in the North Ward.

After consideration of a memorandum prepared by the Medical Officer of Health, Keighley Health Committee recommended to the Town Council recently that an area designated as a smoke controlled area should be submitted to the Minister of Housing and Local Government.

Castleford Borough Council has replied to the Ministry of Housing and Local Government, who wrote inquiring what proposals the Council would make to apply the provisions of the Clean Air Act and how long it would take to have the work finished.

The Council said that until such time as a satisfactory settlement was reached between the National Coal Board and the National Union of Mineworkers on the question of concessionary fuel it would be difficult to make progress with smoke-control orders in mining areas, and asked the Minister what action should be taken to expedite a settlement in this problem.

Diary of forthcoming events

March 14.—NORTHERN JUNIORS: Gas Showrooms, Darlington. 'Early Experiences of Oil Gas Manufacture at Carlisle,' by N. Ollerenshaw. 2.30 p.m.

March 14.—MIDLAND JUNIORS: Victoria Hotel, Wolverhampton. Annual Dinner. 6.30 p.m.

March 14.—YORKSHIRE JUNIORS: York. 'Extension to Gas Grid,' by N. T. Fallon.

March 17.—LONDON AND SOUTHERN SECTION, I.G.E.: Pepys House, 14, Rochester Row, Westminster, S.W.1. 'Interesting River Crossings,' by F. Bell, Distribution Engineer, Southern Gas Board. 2.40 p.m.

March 17.—INSTITUTION OF CHEMICAL ENGINEERS: Church House, Westminster, London, S.W.1. Spring Meeting including paper on 'Methods of Improving Heat Transfer from Condensing Steam and their Application to Condensers and Evaporators.'

March 18.—MIDLAND JUNIORS: Visit to the Works of Stewarts & Lloyds, Ltd. Corby, Northants.

March 18.—SCOTTISH (WESTERN) JUNIORS: Visit to Ravenscraig steel works, Motherwell.

March 18.—INSTITUTE OF FUEL, YORKSHIRE SECTION: Metropole Hotel, Leeds. 'Effluent Gas Cleaning,' by E. L. Brown.

March 18.—EASTERN SECTION, I.G.E.: Hitchin. General meeting, including paper on 'Anti-freezing Measures for Gasholders,' by J. A. Scott. 2.45 p.m. Tour of Stevenage New Town in the morning.

March 18.—MANCHESTER JUNIORS: Visit to Lancashire Steel Manufacturing Co., Ltd., Irlam. Paper by H. Q. Marris, of W. C. Holmes & Co., Ltd., on 'Selection of Dust Collection and Control Plant.'

EDINBURGH HIGH FLATS PROTEST

Decision contrary to majority of tenants' wishes

DISAPPOINTMENT was expressed by the Scottish Gas Board in Edinburgh over the Corporation Housing Committee's decision to make four future multi-storey flats in the city all-electric.

Representatives of the Gas Board and the South of Scotland Electricity Board met the Housing Committee to discuss what the best policy would be with regard to domestic heating and cooking.

Mr. D. Beavis, General Manager of the Edinburgh and South-Eastern Division of the Scottish Gas Board, said that the committee's decision meant that the Board were going to be denied the opportunity of about 18 months to two years housing development in Edinburgh. However, added Mr. Beavis, the Board recognised that such types of houses presented special problems and that the committee's decision did not tie their hands for the future.

It was clear from experience that the tenant of a multi-storeyed flat in this country preferred a domestic heat system which was under his own control and was available for all purposes at any time of the day or night. He recalled that in 1953 Edinburgh Corporation discontinued the practice of providing cooking appliances in municipal houses. Since that date nine out of ten tenants had selected gas for cooking, and these figures demonstrated very clearly the preference of Edinburgh housewives for gas cooking. Freedom of choice also accorded with Government policy in the matter.

In the light of results under freedom of choice, the decision taken by the committee had been contrary to the wishes of the great majority of tenants.

He stressed the important contribution which the gas industry was making to the achievement of smokeless zones. However, the future availability of smokeless solid fuel was bound to be prejudiced if the Board no longer enjoyed the opportunity to negotiate business with tenants in a design of municipal housing which was likely to feature largely in the future housing programme of the Corporation.

Representing the South of Scotland Electricity Board, Mr. C. H. A. Collyns, manager of the Edinburgh and Borders area, set out points in favour of electricity for the domestic consumer. He said that during the past two years sales of electric cookers in the Edinburgh area had gone up by 45%.

The committee decided to give serious consideration to the information supplied by the two Boards.

New D.S.I.R. laboratory opens soon

LORD HAILSHAM will open the new Warren Spring Laboratory, D.S.I.R., at Stevenage, on June 29 next.

The new laboratory is intended to assist Government departments and industry by resources that are are not available in any other establishment of the Department. It will carry out research and development in a wide field and will not be limited to particular aspects of technology. Its initial programme will include work on mineral processing, the synthesis of oils and chemicals from carbon-monoxide and hydrogen, and research aimed at the suppression of atmospheric pollution. Much of this work will be of a chemical engineering character and will require basic chemical engineering research to be undertaken.

The station will be free to take up any research requiring staff and facilities of the type that are being provided.

SIMON-CARVES LTD.

Simon-Carves Ltd. have declared a special distribution of realised capital profits at the rate of 4½d. per 5s. share to be paid on April 3, 1959, to shareholders registered on March 10, 1959. This distribution is exceptional and will not affect whatever final dividend may be recommended in respect of the year ended December 31, 1958.

Mechanical office enthrals children

A PARTY of 30 boys and girls from the commercial group of Dorchester secondary modern school visited the Southern Gas Board's central accounts offices in Winchester Road, Southampton.

They were introduced to the methods used in billing 250,000 customers every quarter and were shown the machines used in this almost completely mechanised system. Punched card machines used for tabulating and analysing information appeared to be of particular interest to them.

A visit to the typing pool introduced them to electric typewriters and some of the latest dictating equipment used to speed the flow of letters.

'Let gas compete' plea to local housing authorities

MR. SYDNEY SMITH, Chairman of the Scottish Gas Board, speaking at the opening of a new showroom in Burntisland, appealed to local authorities to allow tenants a free choice between gas and electricity. The local Town Council have been building all-electric houses for the past four years.

'All that we ask,' he said, 'and we think it is fair and reasonable, is that we shall be given the opportunity to compete with other forms of fuel, and that the tenants of houses should be free to choose the type of fuel they wish to use.'

Gas could provide a full domestic heating service better than, and as cheap as, any other form of fuel.

Trade benefit

The principal trade of the town, shipbuilding, he pointed out, benefited quite substantially through the building of a number of colliers for the North Thames and South Eastern Gas Boards.

Provost Nicol, in opening the showrooms, replied. 'If we had enjoyed the same enthusiasm of drive as we do today then our policy might well have been different,' he said.

'The question of finance is always in front of us. While considering it, we were tempted by the Electricity Board's offer. There would be no service charge at all. When it was nearly £10 per house it was a big temptation to a small burgh.'

He added: 'If there had been more co-operation instead of what appears to be rivalry between the two, it would have been more in the public interest.'

He hoped that in time all consumers would rid themselves of the smoke nuisance and install gas fires.

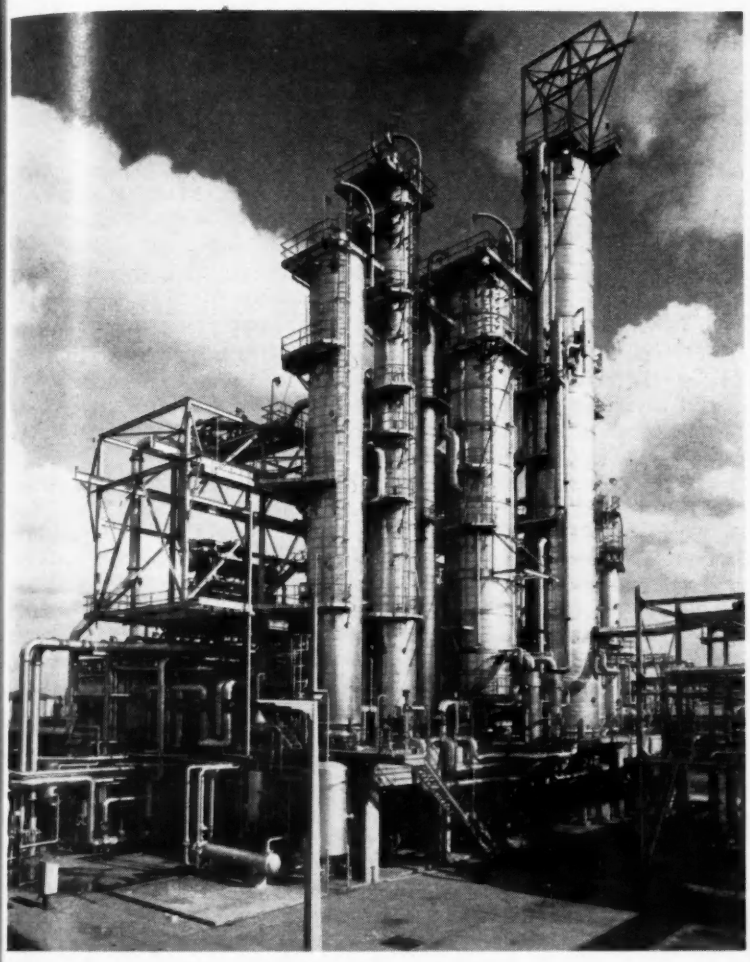
Mr. Smith thanked the Provost for giving the explanation of the Council's decision. He said the Gas Board would never try to challenge electricity as a source of light. 'Burgh engineers and architects look on the cost of wiring as part of the cost of a house but the carcassing of a house for gas as something extra.'

Dean of Guild Curtiss assured Mr. Smith that the Council would give serious consideration to the points he had raised.

Clean air exhibition

THE Lambeth Clean Air Exhibition, held recently in the Assembly Hall, Lambeth Town Hall, featured twelve smokeless fires burning gas, electricity and solid smokeless fuel.

Lambeth Council arranged the exhibition so that the 2,500 families living in the Council's first smoke control area, covering 100 acres, could see the types of appliances available and receive information about the problem. The exhibition was officially opened by the Mayor of Lambeth, who presented cheques from the National Industrial Fuel Efficiency Service to four boiler operatives.



Pictured here is the second distillation unit which is now 'on stream' at the Shell Haven refinery in Essex, on the Thames estuary. This suggests that there may be an increase of tail gas available to the gas industry. The unit, which cost approximately £6½ mill., has a capacity of 11,000 tons of Middle East crude oil and its operation approximately doubles Shell Haven's distilling capacity to about 8 mill. tons a year.

NEW MOVE TOWARDS SAFETY

AT a meeting held at the headquarters of the National Union of Manufacturers to discuss the formation of the proposed Industrial Safety (Personal Equipment) Manufacturers' Association, a steering committee was empowered to finalise details of a constitution already approved in principle.

Membership of the Association will be confined to persons, firms and companies who manufacture in the United Kingdom articles coming within the description of 'personal safety equipment.' The term 'manufacture' includes assembly, provided that some substantial portion of the finished article is fabricated or designed by the applicant, who has a proprietary right in the sale of the finished product.

Although a letter and membership application form will be circulated, names of potentially interested parties may have been overlooked. Applications for information and membership forms should be made direct either to the National Union of Manufacturers, 6, Holborn Viaduct, London, E.C.1, or to E. Roy Mullins, Parmelee (G.B.) Ltd., Bedford Avenue, Trading Estate, Slough.

Alliance & Dublin

THE annual report of the Alliance & Dublin Consumers' Gas Company for the year ending December 31 last shows a surplus, subject to audit, of £89,694. This is after providing for taxation and debenture interest. To this sum must be added £4,053 net sundry interest, £2,880 interest on investments and £23,844, being the balance brought forward from the last account, thus making a total of £120,471. This is an increase on last year's figure of £13,778.

After deducting an interim dividend of 4%, less income tax, the balance available for allocation is £76,285, an increase over last year of £8,255.

Liverpool lighting conversion scheme up to schedule

LIVERPOOL City Lighting Committee reports that progress on the city's gas conversion scheme has been maintained at the level anticipated over the four years since it started.

The committee feels that every effort should be made to complete the scheme within the 15 years originally anticipated.

The original report envisaged that about 11,000 gas positions would eventually be replaced and that some 15,000 electric lamps would be substituted for them. It was then anticipated that the scheme would cost about £600,000.

All the area beyond the periphery of Queens Drive, with minor exceptions, has been dealt with and by the end of March 2,470 gas lamps will have been replaced by 4,080 electric lamps at a cost of £169,430.

'Are the G.C.C.s lapdogs?'

AT a North Thames Gas Consultative Council meeting a *News Chronicle* article by Mr. Tom Baistow, entitled 'Whose side are these consumers' councils on?' was discussed. The author had written: 'Despite the efforts of the more energetic councils to keep the state monopolies on their toes, the customers' watchdogs look too much like contented lapdogs.'

Chairman of the Council, Councillor Edwin Bayliss, said Mr. Baistow had a long conversation with the Secretary, Mr. C. Dimmick, and the activities of the North Thames Gas Consultative Council were made abundantly clear. Councillor Bayliss felt that the article was mainly directed towards transport consultative councils, the constitution of which was dissimilar to the gas industry's. The Secretary had extended an invitation to Mr. Baistow to be present at meetings to judge things for himself.

ELECTROFLO SERVICE TRAINING SCHOOL

SINCE Electroflo Meters Co., Ltd., opened its training school in October, 1958, 18 mechanics from different organisations have attended two-week courses.

During the course, typical industrial instruments for the measurement and control of process variables are discussed, demonstrated, assembled and calibrated, particular emphasis being placed upon maintenance.

Such was the success during the first three months of the school's existence that the 1959 enrolments are on an increasing scale. Six courses have been planned during the first six months of the year, in which service engineers will attend from the area gas boards, the Woodall-Duckham Construction Co., Ltd., and other concerns.

Eastern Junior Gas Association

POSSIBLE APPLICATIONS OF SYNTHETIC RESINS FOR GASWORKS MAINTENANCE

By **G. D. HENDRY,** *Assoc. M.Inst.Gas E.*

THE writer first came into contact with synthetic resins while helping to build a sports car. Its body was constructed from a polyester resin reinforced by glass fibre mat, and proved so successful ultimately that it seemed there must be other uses for synthetic resins besides the building of sports 'specials.' At first many people would only believe the car was really strong and solid after seeing it repeatedly hit with a hammer. This did much to overcome the scepticism of several worthy gentlemen, especially of the maintenance department, when at a later date, seemingly futile experiments were under way.

Since most works are now engaged upon a stringent 'make do and mend' campaign it was thought that if plant could be repaired neatly and satisfactorily or its life prolonged, considerable savings might be made in capital outlay. To this end three main groups of experiments were carried out:—

1. Resistance of synthetic resins to abrasion.
2. Resistance of synthetic resins to crude and concentrated ammoniacal liquors.
3. Resistance of synthetic resins to high temperatures.

Initially the experiments on the works were carried out with polyester resins but these did not prove very successful since the resins did not possess either a strong resitance to chemical attack or a sufficiently high softening point. For use in the transport section for the repair of corroded door panels, mudguards, etc., and possibly in the preparation of mobile display stands on the commercial side, polyester resins have proved or should prove quite satisfactory. At this point contact was made with CIBA (A.R.L.) Ltd. (formerly Aero Research Ltd.) and the writer was introduced to epoxy resins. Owing to the vast variety of resins and hardeners, each with slightly differing properties, produced by that firm, it was thought that at least one resin could be used to advantage.

Before proceeding further, it is perhaps as well to mention in passing the chemical properties of epoxy resins. It must be made quite clear, however, that the writer is not a chemist and most certainly not an organic chemist, and that this is purely a discussion upon the application of synthetic resins rather than one upon their organic structure. Epoxy resins are usually prepared by the reaction of epichlorhydrin with a polyhydric phenol under alkaline conditions. The resins at this stage are soluble and fusible and are therefore cross linked with suitable hardening agents such as amines, amides or anhydrides to give permanently cured products. By the choice of hardening agents differing properties can be incorporated into each resin over a very wide range. At the present time nearly all the raw materials are obtained from petroleum companies and are modified by-products of the distillation of crude oil.

In the experiments carried out, three main resin systems were tried, namely, the X83/8 system, the Araldite 123B system and the Araldite resin 'F' system.

1. Resistance of resins to abrasion. Abrasion tests were carried out on the coke screens and the guide plates of endless conveyors using systems X83/8 and Araldite 123B. The Araldite 123B system was soon discarded as it was found to be too thick to give a smooth and easily applied coating. It was certainly too thick to apply by brush. The X83/8 system was applied with silica flour filler and gave a reasonably easily applied coating. The tests so far carried out have not proved very successful; while some coating remained after two months wear, it cannot be claimed that the life of the screens has been prolonged. In such a place as the water seal of a mechanical producer, where the rate of abrasion is lower, results have been far more satisfactory and very little wear appears to have taken place. Experiments are now in hand for coating the gravity buckets of the vertical retort house conveyors with X83/8 and experiments too are being carried out for bonding the blue brick linings of coke chutes to the metal with Araldite 123B instead of cement. In the past worn coke chutes have given trouble caused by the cement failing and blue brick linings coming adrift, and it is hoped that bonding the brick to the metal really securely, will overcome this particular problem.

2. Resistance of resins to crude and concentrated ammoniacal liquors. Apart from the cost, there has been considerable difficulty in repairing and even obtaining cast iron pipes and specials, so it was felt that there might be a considerable saving if satisfactory repairs could be made with synthetic resins.

Concentrated ammoniacal liquor plant seemed to offer considerable scope, so experiments were carried out both on cast iron and aluminium alloy tubes. Several old cast iron bends were drilled, bound with glass cloth bandage and covered with X83/8. These were placed at different points of the plant two or more months ago and so far appear to be completely unaffected by either

This is the second of three papers submitted in the short paper competition of the Association in December 1958.

crude or concentrated ammoniacal liquors, cold or hot. The cost of repairs was very much less than that of new replacements, e.g., it was found that the cost of coating one of the heat exchanger bends was only £1, compared to the renewal cost of £4 5s. It must be appreciated, however, that sufficient time has not yet elapsed for firm conclusions to be reached, though there are indications that savings can be effected in this section. Of the experiments made on the alloy tubes, the first was the coating of an old aluminium alloy tube with glasscloth bandage impregnated with X83/8, which was placed in the top section of the heat exchanger, where the temperatures of the incoming vapours and outgoing crude liquor were highest. Before a true assessment could be made, however, the tube failed in the non treated portion. Two more tubes were then coated, but with a volanised glasscloth bandage and system X83/8, and placed in the retort house, since it was suggested that heat treatment during post cure would improve the cross linkage between the resin and the hardener, so as to give it a greater resistance to chemical attack. After heat treatment for one week, one tube was placed in the top section of the heat exchanger, and the other at the inlet to the coolers. The tubes remained there for two months. When taken out the coating of the heat exchanger tube was found to be badly pitted but the coating of the coolers' tube was unmarked. This and other experiments showed that, although hot ammoniacal vapours attack synthetic resins, cooler concentrated solutions do not, or at most to a very limited extent. Though not fully successful they indicated that synthetic resin tubes could at least be used in 'coolers' section. A worn-out tube was, therefore, coated in its entirety to give in effect a synthetic resin tube. The cost including the labour of cleaning and coating a tube, 10 ft. long by 2¾ in. diameter, was approximately £2. Taking the scrap value of the tube as being 10s., the actual cost came out at £2 10s. compared to that of new tube of £6.

3. Resistance of resins to high temperatures. There is often difficulty in repairing cracks appearing in the bottom ironwork of static vertical retorts. The usual procedure is to use Nigol to fill the cracks or attempt to weld them. Here again there might be a use for synthetic resins, and when a crack was noticed on one of the extractor castings the system employing casting resin 'F' and hardener 972 was bought into play. (This coating is probably much better than X83/8 but depends upon hot curing for its effectiveness and this is sometimes difficult.) The crack was covered with glasscloth impregnated with casting resin 'F' and as the temperature of the casting was about 80°C. at time of application the curing temperatures called for in the instructions were easily obtained. Up to the present there are no signs of the crack re-opening or of the coating fracturing; in fact the repair now appears to be part of the casting.

Experiments at Bow Common

Purifier grids have become a very expensive item and experiments are at present in hand to coat new grids by dipping them in resin system 820, employing two parts of hardener to three parts of resin. This resin is less expensive than X83/8 but has not quite the same high resistance to chemical attack. Such experiments are of course, long term and the first indications will not be available for at least another year. It is believed that experiments are at present in hand at the Bow Common works to coat steel trays of tower purifiers but no details are known by the writer.

The most recent experiment carried out has been the coating of the lagging of some steam pipes with a very open weave bandage impregnated with experimental system X83/7. This system consists of a straight mix of two parts resin to one part hardener, and is purely a hard protective coating over existing asbestos lagging. It looks very much neater than the conventional roofing felt and wire netting, and of course, is completely water and corrosion proof. During the course of these experiments one or two factors have emerged:—

Shot Blasting Best

1. Cleaning. Too much importance cannot be placed upon the necessity of really cleaning the surface right down to the base metal before applying the resins. These resins will bond to anything including paint, rust and mill scale and unless these are removed first, the coating will peel off. Shot blasting is, of course, the best method of cleaning but failing that the flame gun or, for small jobs, an electric grinder could be employed.

2. Application. Where possible (X83/8 for example) the resin should be allowed to cool to room temperature, since, if it is applied at too high a temperature, much of the resin will flow out and the mix may gel before one is ready. Conversely if the resin is applied at a low temperature, difficulty may be experienced in applying it by brush.

3. Mixtures. Thirdly, it is important to obtain the right proportion of ingredients. It is futile just throwing the things together and estimating the amount of accelerator needed. Either the resin will not harden at all or else it will cure so rapidly that both the containers and brushes are lost.

4. Hygiene. While the containers and brush may be cleaned with acetone the hands should not come into contact with this chemical or there may be risk of dermatitis due to the skin's natural barrier being destroyed. Barrier creams should be used at all times.

5. Expense. Synthetic resins are at the moment very expensive and care should be taken wherever possible to avoid waste. Small quantities only should be made up at any one time, for once the resin and hardener have come together the resultant mixture must be used before gelling or else it will have to be thrown away.

6. Applications under pressure. Generally speaking it has been found difficult to apply synthetic resins under pressure conditions either from gas or liquids. One notable exception however has been the use of Araldite 123B for sealing a weld which had opened up on a gas main. An opportunity is now awaited to try a similar experiment with regard to stopping leaks in gasholders. There are probably many more applications than have been mentioned here. The coating and repair of underground mains or even the manufacture of glass fibre mains appears to be a distinct possibility. The coating of a gasholder would put an end to corrosion problems but the initial cost of preparing the surface would be very high.

From a paper to the London and Southern Junior Gas Association, February 6.

Safety and Economy in Gas Distribution

By G. A. WESTBROOK, Assoc.M.Inst.Gas E.

ALTHOUGH the commercial future of the industry depends upon the price of gas, appliance design and its cost, and other factors, it is equally true to say that the public must have confidence in the method of distributing gas, particularly in the avoidance of leakages. Ideally, gas should be supplied so satisfactorily to each consumer, that he merely turns on a tap and gives no thought to the means by which the gas reaches the tap. The technique of distribution should be unobtrusive. When this is attained and maintained a significant contribution towards sales progress has been made. The cumulative effect on the public of incidents connected with escaping gas necessitates every effort being made to solve the problem of leakages and the judicious expenditure of thought and money to reduce them is sound economy.

The essential duties of a distributing engineer are (1) the maintenance of satisfactory pressure to every consumer and (2) the elimination as far as is possible of leaking plant, both of which should be carried out at the minimum cost.

Common Sense

Considerations of safety and economy are fundamental in all day to day work carried out by the distribution department and by far its greatest expenditure occurs on routine jobs such as laying small mains and services. More often than not the size of mains or services is not determined by calculation, but by the application of common sense and experience, combined with the availability of standard size pipes. In some instances, however, the vital economic importance of the selection of the size of the main and its operational pressure are fully appreciated. Lacey in 1923 illustrated the significance of viscosity in flow calculations, but the design of distribution plant is governed primarily by the assessment of the quantity of gas to be carried and for this to be accurately forecast, the planners need vision and keen political perception to anticipate future demands. Such considerations can completely dwarf the effect of viscosity which in itself has quite an influence on flow calculations. The distributing engineer carries the responsibility for applying to every-day distribution practice. He must be able to anticipate the long-term result of current techniques, keeping safety and economy in the forefront of all his calculations.

One of the most important factors in achieving safety and economy in distribution is good quality work. For this reason the supervisory organisation of the North Thames' distribution department arranges that most mainlaying and servicelaying gangs are visited every day by a foreman or an assistant foreman. These visits assist in the direction of jobs as well as ensuring satisfactory work. Technical staff also visit the more important jobs daily and less important ones as often as time permits.

The Board's area is divided into eight divisions, and in each division a distribution officer is responsible through assistant distributing engineers to the distributing engineer for the technical management of his area. The distribution officer has three to five assistants according to the size of the division and a drawing office with several draughtsmen. The divisions are sub-divided into depot areas. At each depot the mains foreman, aided by an assistant, manages the day-to-day work. The mains foreman is responsible to the distribution officer. The compact geographical nature of the North Thames area permits close supervision of most jobs. The distribution officers meet once a month under the chairmanship of the distributing engineer, when technical matters can be raised and discussed.

Trouble free mains and services are the ideal towards which we are striving. Here the distributing engineer comes up against one of his greatest problems. Distribution personnel are scattered over the whole of the Board's area and it is probable that most routine jobs are seen by a supervisor for only a few minutes each day. Under certain circumstances they may not be seen at all. How then can he be assured that all work carried out in his department is satisfactory, particularly when it is concealed underground and virtually impossible to inspect? Clearly normal supervision cannot adequately cope with this situation; it must be instilled into the mind of every operative just what is required of him. He should be encouraged to take as keen an interest in his work as possible so that he develops a pride in his work and can be relied upon without constant supervision.

Correct Approach

Perhaps this is a tall order, but it must be attained, and the responsibility for initiating the stimulus rests with the distributing engineer. His chain of command down to the operator must have no weak link, and to avoid this, each individual with supervisory duties must be technically equipped and have the correct approach to guide and stimulate the interest of those below him.

The senior officers of the department can draw upon wide technical experience and literature to keep in touch with international trends in technology, by which, combined with indigenous ideas, a distributing engineer may plan technical development along the right lines. But for the operative the position is different. He cannot be expected to read about his work. He will only act on what he is told and on his own experience. How can we guide him? The supervisory

staff must make sure that he knows exactly what is required in his work and they must be prepared to advise down to the minutest detail. They themselves, therefore, need to know precisely what is required, and it is here that the importance of the chain of command comes in. The more senior the individual, the greater is his responsibility to communicate ideas and knowlege and to encourage his staff to produce only the best.

A high standard of tools, equipment and design from manufacturers and suppliers help the operative to contribute with greater interest towards the production of a first class job. For example, to maintain a good standard of welding for fabricated specials from outside firms, it is our usual practice to test all important fabrications by gamma ray to ensure conformity with the desired standard. Similarly, by utilising carefully tested wrappings and where necessary protecting them cathodically, the operator becomes corrosion control minded which emphasises the need for his own work to be satisfactory.

The operative can be helped by a practical course designed to instruct him along the right lines. In the past the job was learnt by watching and copying more experienced workers. Though this has certain advantages, insofar as the tradition of caution and care in dealing with gas is passed on, it allows bad practices to multiply and starts many potentially skilled men off on the wrong foot.

As far as possible methods should be developed which do not make too great a demand on the operative. In the all-important external protection of pipes, for instance, if a simple wrapping is adopted it is more likely to be satisfactorily applied than a more intricate one. The current tendency to use factory sheathed pipes and simple tape wrappings is for this reason a major advance in the effective protection of pipes.

Emergency arrangements are on a depot basis. Distribution men from each depot are on call at their homes for any emergency after normal hours. They are paid a stand-by allowance and are organised in teams of three. Each team operates on a rota, so that at any time there is available a first stand-by team, with second and third team reserves to call on if necessary. The general method of operation is as follows:

Short Wave Radio

A telephone message from the consumer or public is received at a central control office where it is passed on by short wave radio to a patrolling service van in the area concerned. If, following the service van's visit to the emergency, distribution personnel are required, a radio call to the central control office is made. A telephone instruction is then given to the appropriate transport depot which is open at all times and has compressors immediately available. A compressor designed to carry men and tools, then picks up the stand-by workmen from their homes and transports them to the job, and stays with them to provide tools and road opening facilities. If the servicelayer in charge of the job, thinks that a foreman should be present, he makes a phone call to the foreman's private house. For each depot a foreman or his assistant is available at home for such an emergency. Should the foreman regard the emergency of sufficient importance, he would phone a divisional technical officer who is available at home on a rota basis. In the event of a major occurrence, the distributing engineer or his assistants would be informed. The foregoing emergency arrangements may seem costly but they are adequate which is the essential requisite. In the winter in very cold weather, the number of the Board's compressors available may be insufficient to cope with the increased emergency work, so that contractors' compressors are used to supplement the need and the transport of men and tools to jobs is effected by an allocation of the boards' vehicles diverted from other less important duties.

Desirable though satisfactory emergency arrangements may be, it is far better if their need can be reduced by improved quality of work and materials.

Life of a Main

The worst type of escape is the fractured main, which, without warning, allows perceptible quantities of gas to permeate the soil and travel through adjacent ducts, possibly reaching premises. Fractures usually occur in cast iron mains, and there is no way of anticipating when or where they will occur. For over 100 years mains have been constructed of cast iron and have given, in general, very good service. Samples of iron taken from cast iron mains over 100 years old show that the iron is in excellent condition and its thickness has hardly been reduced during its period of use. The life of a main is governed primarily by the nature of the soil in which it lies. There are some districts where the soil is bad and its character is indicated by low electrical resistivity and the presence of moisture or sulphate reducing bacteria.

There may be serious escapes, however, from cast iron mains which fracture even when the soil is good and where the pipe appears to be in generally sound condition. Steps can be taken to alleviate this problem when laying new mains or replacing old ones, among which are:

1. Ensure that all pipes are well and truly laid and the trench bed is even and free from hard substance which could act as a fulcrum and produce a bending moment in the pipe.

2. When pipes are unavoidably laid close to dwellings, protect the external surface of the pipes with a wrapping or coating which is mechanically strong as well as a good dielectric. This should reduce the rate of leakage from a fractured pipe and add years of satisfactory life to pipes thus protected.

3. Consider the use of steel pipes.

These three points need further elaboration.

(i) Most fractures in main are caused by stresses applied to the affected pipes. These stresses can be caused by soil changes due perhaps to temperature variation, subsidence, or variation in moisture content, factors over which the engineer normally has no control. There is, however, no actual evidence that such influences are present each time a main is broken. They are difficult to prove. Temperature variation in the ground does not appear suddenly and should be uniform over the length of one pipe at least. Paving can influence the penetration of frost, but pipes under all types of paving can be affected. Nevertheless, it is a

fact that there is a larger incidence of fractured mains during cold weather than at other times.

Valuable statistics are being accumulated by the Institution of Gas Engineers on the subject of broken mains, and the investigations now proceeding may provide substantiated opinion on their causes and prevention. Moisture content, in clay soils particularly, can account for changes in unit volume of earth with resultant stresses on buried pipes. Evidence of this exists since in certain clay districts several fractures occurred during a very dry hot summer; the soil had large cracks caused by contraction while drying out. However, if a pipe is laid on a true bed with no stones or other hard material beneath it the chances of concentrated stresses are probably reduced. Similarly, if service connections are properly made and of the right size, i.e., with not too large a hole in the main, the chances of fractures are reduced.

More Flexibility

A further contribution towards solving this problem has been made by the Board placing a limitation on the length of small diameter cast iron pipes. This is now 12 ft. and the closer spacing of joints will permit more flexibility and reduce the likelihood of fracture.

(ii) Because the location of any fracture cannot be pre-determined, it seems a reasonable alternative to take steps to reduce the magnitude of the impending escape, more particularly when the pipes are laid very close to dwellings. If a pipe protected with a dielectric wrapping should be fractured, the leakage of gas should be contained to an appreciable extent allowing a valuable breathing space to all concerned before its discovery.

A satisfactory wrapping is P.V.C. tape (without an adhesive), wound around the pipe on site by means of a simple wrapping machine. The absence of the adhesive allows movement between pipes and tape and prevents the tearing of the tape which would otherwise be subjected to tension in the event of a fracture.

In the North Thames area, pipes laid in close proximity to buildings are externally protected in this way. Pipes laid in other positions are protected with bitumen asbestos sheathing if laid in very corrosive soil and cathodic protection applied. The overall effect of these precautions is to give a much longer life to the pipes. The cost of protection is about 6s. a yard for a 4-in. pipe, which represents an overall increase in cost of 8% to 15%, varying with the paving under which it is laid.

(iii) An important feature of steel mains is that normally they do not fracture. Consequently, escapes from them are generally less sudden and may well be dealt with before attaining very serious proportions. Steel mains are more easily affected in corrosive soils than are cast iron pipes, and adequate external protection is therefore vital. They are usually produced in lengths difficult to handle in built up areas and service connections are less straightforward than with cast iron.

The advent of flexible joints has greatly reduced the probability of escapes. It is very rare for a flexible joint to leak, but they need to be properly assembled, i.e., all parts must be clean and bolts tightened with care. It is our practice to use a torque spanner set to 80 lb. ft. to ensure correct tightening. Sample bolts are regularly and systematically tested at the central stores for tensile strength.

There are 426 miles of medium pressure mains in the North Thames area, of which 214 miles are constructed of socket and spigot pipes with lead joints. Of these joints, 51% have been fitted with leak clamps over the past 20 years, which has proved very successful. Protection against corrosion is ensured by moulding with a pitch compound. The cost of resetting and clamping joints is increased by approximately 10% by moulding, but it is a very sound investment.

On steel mains all welded joints are now of the butt type, the pipe ends being bevelled to standard. Welding is by the electric-arc process and has to conform to A.P.I. 1104 (latest edition), together with any additional requirements quoted in the Board's specification for mainlaying.

In selecting materials for service pipes two objects must be kept in mind, (1) to give longer life to the pipes, and (2) to prevent escapes during their lifetime. By satisfying the first the second is automatically met. For many years, service pipes have been protected externally from corrosion. Sand and cement in troughing has been extensively tried out but it has not been wholly successful. It permits the penetration of moisture through the concrete to the pipe. In dry soils concrete is more effective, but in such soils corrosion problems are of less concern. Pitch in troughing has been tried but handling difficulties discouraged its use; a tendency to become brittle and mechanically weak made it unreliable. Wrapped tubing of various kinds have been used and this method seems to offer the best solution so far. The wrapping must provide 100% perfect insulation otherwise one weak spot may develop into a leak and the pipe will eventually give trouble. To obtain complete protection of the pipe, the wrapping is tested for holidays and where these are found the fault is remedied before the pipe is used.

Wrapping on Tubing

In the North Thames Gas Board's area, approximately £1.2 mill. is spent annually on new services, renewals and repairs, and particular attention has been given to the quality of the wrapping on tubing. Considerable assistance is obtained from the Board's stores testing laboratory and, combined with the site inspection and treatment of tubing, a reasonably high standard of wrapping has been achieved. The essential qualities required in a good wrapping are adherence, physical strength, moisture resistance and electrical resistance.

When testing, the emphasis is placed on electrical resistance because if this is satisfactory subsequent corrosion is not likely to occur provided the wrapping adheres well and can resist physical impact. A greater appreciation of the electro-chemical process in corrosion has led to an abandonment of the earlier method of testing wrapped tubing, which consisted of the measurement of electrical resistance while the pipe was immersed in water. Now testing is carried out in air by the use of a high voltage electrical discharge. Faults or 'holidays' found by this method are detected by the flow of current (indicated by sparks) through the wrapping at the holiday location. When this form of testing first started many holidays were found and were detected at the

rate of one every few inches but subsequent improvement in wrapping has reduced this to one fault for about 100 ft. of pipe.

Faults on tubing can be divided into two main categories, (1) manufacturing and (2) handling.

Faults in manufacturing were thought to be due partly to blow holes formed by the hot application of the coating or the cracking of the coating on cooling, or perhaps by uneven coating. Blow holes were reduced by ensuring that the primer applied to the tubing was dry before applying the coating to avoid the evaporation of thinners. Coated tubes at one time were rolled in sand but this was discontinued as penetration of sand into the coating frequently occurred and some sand used contained metal particles. The greatest advance in wrapped tubing has been the application of a thicker coating in two stages. This double wrapping has caused the elimination of most holidays and its thickness has at the same time reduced handling faults. For these reasons the Board orders only double wrapped tubing and although the initial cost is greater we are convinced that it will result in ultimate saving. It is, nevertheless, hoped that a satisfactory thin wrapping will eventually be found.

Simplification of Routing

Handling faults have been further reduced by improved methods of transport and a simplification of routing. Tubing is now received lime washed and in bundles protected by corrugated sheeting. This has eliminated the problem of tubes sticking together and physical damage is greatly reduced. There is now a greater appreciation among operating staff of the need for careful handling. Deliveries direct from the makers to the depots where the tubing is required for use has reduced redundant handling and the associated handling faults. But there is still scope for improved wrapping since this might eliminate the need for testing every length of tubing. It may be achieved by the use of entirely different materials, *e.g.*, the substitution of high impact P.V.C. tubing for steel, but such changes have to be brought about cautiously.

Apart from corrosion, other problems connected with service pipes are receiving attention. The rigid screwed joint is being partially replaced by couplings which allow a considerable degree of flexibility. At the connection to the main it is the Board's practice to use a screwed coupling; similarly, where a service pipe enters a rigid house foundation another coupling is employed. This allows relative movement to occur between the house and service pipe with less risk of fracture to the pipe. Since screwed ends of pipe represent a weakness from the reduced pipe-wall thickness, the complete change-over from the rigid screwed joint to couplings is being seriously considered. The elimination of the screwing of pipes on site would also save time.

Where services are to be given cathodic protection, couplings employing metal rings to ensure electrical continuity are used. Service pipes now being laid under solid floors are deliberately oversize to enable normal-sized pipes to be inserted through them should replacements be necessary. It is costly and an extreme nuisance to the occupier to locate and remedy leakages under solid floors, so to facilitate the insertion of the smaller pipe, the larger pipe carries in every case a 92½° smooth bend where it connects to the upright. The inserted pipe would need to be copper to negotiate this bend, but since copper is more noble than iron in the electro-chemical series, there is no corrosion hazard in the two pipes being in contact.

In the North Thames area there are many large district governors, the commoner sizes being 12 in., 18 in. and 24 in., which supply large, densely populated areas and it is important that they should function correctly. Generally the inlet pressure range is about 50 to 120 in. w.g. with an outlet pressure varying from 4½ in. to 8 in. In most cases they are gas loaded. The system usually adopted, known as the pressure unloading, means that an auxiliary pressure under the bell or diaphragm governs the flow from the governor; the lower this auxiliary pressure, the greater the flow through the governor. The pilot governor controlling the auxiliary pressure was, for many years, housed in a column used for ventilation, situated above ground adjacent to the governor. The freezing of the pilot governor, however, during sub-zero weather conditions caused difficulties, which were later overcome by the use of a heater. These columns were also vulnerable to damage from moving vehicles straying from the highway, since they are usually sited on the footpath close to the kerb. The effect of severe physical impact is that the auxiliary pressure is lost; the main governor valves drop wide open and the inlet gas is able to pass through to the outlet.

To overcome this danger, a safety valve set to pass gas at 10 in. w.g. pressure has been installed, which permits gas from the governor outlet at a pressure over 10 in. w.g. to pass into the space beneath the bell or diaphragm, causing the main governor valve to rise and close. This safety valve, therefore, regulates the maximum outlet pressure at 10 in. w.g., which can do no serious harm on the district.

In many cases the pilot control system has been removed from the column and placed underground in the pit where the main governor is housed. This has its disadvantages of course, since the controls are less accessible and are likely to be affected by the moister conditions usually found underground. The effect of moisture can be offset by the use of desiccators or the installation of a two pilot governor system instead of clockwork loading of the pilot governor. The two governor system gives choice of only two pressures throughout the day, but it is found that in many areas two pressures are quite satisfactory, one for the day and the other for night time and long off-peak periods.

Twin Diaphragms

In the North Thames area there are a number of small governors employed on a high pressure system which operates in the South Essex area. These governors are used when new estates are developed, to enable low pressure gas to be supplied to the individual consumers without the need for service governors. In some cases these smaller district governors control one street only. To avoid a build-up of pressure on the outlet side at quiet periods, a large vent is installed on the outlet. Since the most vulnerable part of a governor is its diaphragm, twin diaphragms are generally fixed which considerably reduces any risks from split diaphragms.

During the extremely cold weather in February, 1956,

MAIN makes news ...

* *

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there were occasional instances of h.p. service governors freezing when governors were in the closed position. To overcome this difficulty arrangements were made to inject methanol into the main stream of gas some distance from the compressors. Since this has the effect of lowering the freezing point of any moisture which may collect in the distribution system, it is considered unlikely that the freezing of service governors will occur again.

Economies may be affected when designing inlet connections to governors. Formerly an 8 in. governor, for instance, would have 8 in. connections on both inlet and outlet, but it is usually practicable to have much smaller connections at the inlet than at the outlet. The inlet size is a function of the minimum pressure likely to be experienced in the high pressure feeder main. In most cases this pressure is adequate to permit some drop of pressure in the inlet assembly. By keeping the distance between the feeder main and the governor to a minimum the loss of pressure at the inlet can be kept to negligible proportions even though a relatively small inlet pipe may be used.

Connection to Feeder Main

In the Board's area the average minimum inlet pressure is at least four times the maximum outlet pressure and there is no reason why in such cases the inlet pipe cross section should exceed say 40% of the outlet pipe cross section. In the case of small high pressure governors, e.g., 2 in. governors feeding say 100 houses, the connection to the feeder main can be made in the same way as a normal high pressure service connection. This consists simply of a service clip with a full way cock attached and through which a $\frac{5}{8}$ in. hole is drilled in the main. This eliminates the need to cut out the feeder main or to employ costly drilling apparatus and fittings. If one such connection is considered insufficient, others could be added as required; a separate small governor will be installed on each connection with the governor outlets discharging into a manifold leading to the outlet district main. On the high pressure system operat- in South Essex it is unusual for governor inlet pressures to drop below 10 p.s.i.g. The discharge through a $\frac{5}{8}$ in. orifice at this pressure is approximately 2,000 cu.ft., sufficient to supply 80 consumers—allowing .5 lb. pressure per head across the orifice.

As far as is practicable, the installation of service governors is avoided. Although improvements in governor design are constantly taking place, there is always the possibility of a let-by of gas, which makes the installation of vent pipes essential. These are most unpopular with consumers, since there seems no truly satisfactory location for the pipes. If they are run to the top of the house, they are inaccessible and blowing is not too easily detected; if they are placed any lower they become an embarrassing source of leakage when the seal blows. Modern service governors are well designed and the standard of manufacture is good. If, however, particles of rust are carried forward in the gas stream physical interference with valve closing will occur. Filters can be employed to entrain the particles, but to be effective filters need frequent replacement, which constitutes a nuisance to the consumer.

Unsafe conditions can arise if pressures are too low or indeed if they are too high. The average pressure in mains in the North Thames area is 4 in. to 5 in. w.g. and ungovernored appliances are adjusted for this range. As a preliminary step to ensure that pressures at all consumers' premises were satisfactory, a pressure survey of the North Thames area was made during the winter of 1947-48. Except for the remote country spots, the area was divided into $\frac{1}{2}$-mile squares and pressures taken on what appeared to be the weakest main in the square. In domestic areas the pressures were read during the Sunday peak period in cold weather and in industrial areas on Monday mornings when consumption is normally at its peak. In country areas, pressures were taken at selected points though not on a grid basis.

Where minimum pressures below 3 in. w.g. were recorded, steps were taken to improve them. These consisted of one or more of the following:

1. Increasing pressures at governors whether at the works or on the district.
2. Installing additional governors.
3. Laying new mains.
4. Connecting mains with good pressure to others in need of more gas.

It is pertinent to point out that the minimum pressures occurred for only ten to 20 minutes in most instances, but this fact did nothing to deter us from the resolution to effect improvements. Four years later in the winter of 1952-53, a further check on pressures was made. This time, however, the examinations were limited to (a) those areas where appreciable development had occurred during the previous five years, (b) those areas where steps had been taken to improve the position previously, and finally (c) those areas which had originally been near the permissible minimum of 3 in. w.g.

Appropriate action to attain satisfactory pressures was initiated immediately. In subsequent years, poor pressures have been dealt with as they have come to light in the ordinary course of events, although this winter a limited survey has been arranged. It is an extraordinary fact that poor pressures are often not reported by consumers who it seems can get accustomed to unsatisfactory performance of appliances. There is always the danger that such consumers may ultimately turn from gas without being aware of the improvements that could be effected if the Board were aware of the conditions. Quite often after relaying the main and service pipes in a road, consumers remark that 'It doesn't seem to be the same gas!' Expenditure on improving pressures is essential for retaining public confidence.

Underpressure Device

In the past it was the practice to shut off the main after suitable warning had been given to the consumers affected. Before restoring the supply, all consumers had to be contacted and their appliances checked. Latterly the distribution department has been using an underpressure device which permits the flow of gas through the main during the operation of cutting out by by-passing the section of main being repaired. In this way continuous supplies to all consumers are maintained.

In 1953 a gassing incident on Canvey Island following the sea-water floods brought home the pressing need to deal vigorously with the underground plant on the island. The mains were all high pressure, ranging

from 7 to 35 p.s.i.g. constructed of steel and externally protected with an impregnated hessian wrapping. The soil is clay and mostly damp with a resistivity in the region of 200-700 ohms. The life of the mains seemed to be no longer than 20 years. The services on the island were, of course, high pressure and service governors were installed on consumers' premises, frequently well inside the building line. Escapes from these services in dwellings could have serious consequences. The mains corroded badly and gave rise to frequent escapes. Remedial action took the following form:

1. A high outlet pressure governor was installed on the 6-in. feeder main to the island. This broke the pressure down to 12 p.s.i.g., which is adequate normally for the island, and reduced the rate of escape from subsequent leakages.

2. Those portions of the services within dwellings were shortened and the governors sited immediately inside an outer wall.

3. To facilitate the detection of leakages by consumers, the gas entering Canvey Island was further odorised. It was on Canvey that the earliest experiments in odorisation took place, not only for the testing of different types of apparatus for adding odour but for determining the most suitable odorant. Tetrahydrothiophen was ultimately found to be the most successful.

4. To consider the conversion of the distribution system on the island to low pressure. This would be costly and would have to be brought about gradually.

A low pressure scheme was designed for the island and as mains needed relaying they were replaced with pipes of size and material consistent with the new low pressure scheme. It was realised, however, that the principal feed to the island would have to remain high pressure, but every effort was being made to reduce the need for h.p. mains. During the process of conversion which is still going on many mains had to be relaid and remain on the high pressure system. In these cases the mains were laid in steel with bitumen asbestos sheathing and electrically protected. The size selected generally was 4 in., thus permitting their ultimate use at low pressure. Mains for immediate use at low pressure were laid or relaid in sheathed cast iron. Services were relaid at the same time as the main, 1 in. or 1¼ in. according to their length. All mains and services have been given cathodic protection. Packaged, 22-lb. magnesium anodes have been used in the cathodic protection scheme, but owing to the extent of network to be covered and the poor quality of the wrapping of older plant impressed current schemes were later adopted for selected areas of the island.

Automatic Filling

There are two high pressure holders on the island, one cylindrical—the other spherical, each holding 162,000 cu.ft. at 50 p.s.i.g. Both have now been converted to automatic filling and a cam-operated governor controls the passage of gas from the holders to the high pressure mains system. Filling is designed to occur at off peak periods, a minimum pressure of 7 p.s.i.g. is maintained in the filling main. The holders discharge only at loads, to maintain a minimum pressure of 10 p.s.i.g. in the filling main which then becomes a district supply main with reversed flow.

The gas industry is making a tremendous effort to improve its position in the fuel market. The production engineers are displaying remarkable energy and ingenuity in pursuit of the cheaper therm. The commercial personnel are striving indefatigably to capture new markets and to develop existing ones. These commendable efforts can be jeopardised seriously if distribution failures cause disquiet among consumers and public generally.

Dependability of Distribution

The responsibility which rests on distributing engineers and all others engaged on distribution is traditionally recognised and accepted. Over the years experience has taught them that caution can seldom be over-emphasised and that only the highest class work can be permitted. This same caution, however, has tended to restrict the ready adoption of new techniques, but undoubtedly a new look is making itself felt. New ideas are appearing and by careful examination and selection they are being applied to further the dependability of distribution.

NALGO Now Britain's 7th Largest Trade Union

BRITAIN'S office workers are becoming increasingly trade union conscious. And none more so than the 'back room' staff of the nation's public services—in local government, health, gas, electricity and transport.

Figures just published show that Britain's fastest growing trade union is the National and Local Government Officers Association; that its membership on October 31, 1958 (251,682) now makes it the seventh largest of the nation's more than 400 trade unions—previously it was eighth.

During the ten year period from 1947-57 (the latest period when there are comparable figures with the other ten major trade unions) NALGO's membership increased by no less than 68%. Several other major trade unions faced a slump in, or found it difficult to maintain, their membership during this period.

'It is a remarkable achievement of which we are, naturally enough, extremely proud,' says a NALGO spokesman. 'One of the main reasons why we are increasing in size at the rate of about 5,000 members a year is because of the wonderful recruitment work being carried out at branch level by our voluntary officers.'

For many years now NALGO has been the biggest of the nation's 'white collar' trade unions.

From 1947 to 1957, NALGO's membership increased by 100,000—from 146,000 to 246,000. Further evidence of the trend towards trade unionism among Britain's office workers is that the only other union that comes near to NALGO's record in recruitment is the National Union of Public Employees—with an increase of about 59,000 (47%) between 1947-57.

From a paper to the Manchester District Junior Association of Gas Engineers, Liverpool, December 10, 1958.

A Comparison of Carbonising Results Between Lancashire and Yorkshire Coals

By JOHN PARKINSON,

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IN an attempt to compare the different gas-making properties of Lancashire and Yorkshire coals, gas-making results from 100% Yorkshire coal during the period August 17 to September 7, 1958, have been compared with results obtained from 100% Lancashire coal during the period September 21 to October 5, 1958. The carbonising plant used for these tests was one bench of West's continuous vertical retorts, comprising five beds, each of eight 40-in. major axis retorts, making a total of 40 retorts with a nominal throughput of 160 tons per day (no scurfing). Producer gas for the setting was supplied from five independent, non-pressurised, step-grate producers.

One great difficulty in a large-scale test of the carbonising properties of a coal is that of obtaining a large enough quantity of that coal for the test to continue long enough for settled carbonising conditions in the retort house to be reached. When No. 2 Bench of vertical retorts was idled at the beginning of July, last year, the opportunity was taken to make use of an allocation of approximately 900 tons per week of Lancashire coal. Unfortunately, coal stocking difficulties confined the test period to two weeks, and, although the time was therefore short, it did provide a means of arriving at a reasonable comparison between the two types of coal.

The figure to which most attention must be given is the net cost of coal carbonised, *i.e.*, the cost of coal after allowing for coke, breeze, tar and ammonia credits. It was deemed inadvisable to state the actual cash price of the various coals as delivered to the works, so in order to provide a common basis on which costs could be compared, the price of Yorkshire coal was taken as 100 units, and the costs of the Lancashire coal, and coke made, calculated accordingly.

The weights and the proximate analyses of the various coals carbonised are shown in Tables 1 and 2.

TABLE 1

Yorkshire coal	Tons carbonised	C. V., as received	C. V., dry ash free
Elsecar washed doubles	516·65	14,430	15,300
Manvers Barnborough Park Gate washed doubles	166·85	14,450	15,280
New Stubbin washed singles ..	1,232·20	14,470	15,400
New Stubbin washed doubles ..	427·40	14,650	15,460
Stock coal	322·0	—	—
Lancashire coal			
Moseley Common washed doubles	1,931·45	13,770	15,160

TABLE 2

Coal	Moisture	Ash	V.M.	Fixed carbon	Sulphur	Swelling No.	C.V. max.
Yorkshire	2·8	3·0	34·8	59·5	1·04	7½	14,490
Lancashire	4·7	4·5	35·5	55·2	1·61	5½	13,770

Proximate analyses.

By substituting these figures in the following formulæ, the theoretical yield of gas and coke per ton of coal carbonised may be calculated.

$$Hg = 0.727\,(HC - 3.25\,FC - 3)$$

$$C = 0.2\,(FC + A) + 0.2$$

where Hg = the quantity of gas in therms per ton (on coal as received) at a c.v. of 450 B.t.u. per cu.ft. to holders.

C = the weight (gross) of dry coke and breeze made (cwt. per ton) on coal as received.

HC = calorific value of the coal as received,

$$= \frac{\text{B.t.u. per lb.} \times 2240 \text{ therms}}{10^5}$$

FC = percentage of fixed carbon in the coal as received.

A = percentage of ash in the coal as received.

Table 3 shows these results tabulated.

TABLE 3

Coal	Gas, therms/ton (calculated)	Coke and Breeze (calculated)
Yorkshire	93·2	12·7
Lancashire	91·7	12·14

The operating conditions of the carbonising plant were modified by reducing the steam admission from 12% to 10% and increasing the coal throughput from 3.5 to 3.8 tons per retort day to maintain the calorific value of the purified gas at 450 B.t.u. per cu.ft. These alterations influenced the yield in gal. per ton of weak liquor made, and though investigated, no correlation between the figures could be found. The recovery of ammonia from the concentrated liquor plant dropped when carbonising Lancashire coal by approximately .5 lb. of ammonia per ton of coal. Investigation into these figures gave no further reliable information.

Below are set out the carbonising results.

1. Yorkshire coal.

Coal carbonised—tons per retort per day	3.5
Gas volume—cu.ft. per ton of coal carbonised	20,390
Calorific value of gas. B.t.u./cu.ft. ...	450
Therms per retort per day	321
Therms per ton of coal carbonised ...	91.5
Coke yield-cwt. per ton ex retort house	9.44 cwts./ton
Industrial boiler fuel-cwt. per ton ex retort house	0.54 cwts./ton
Breeze cwt. per ton ex retort house ...	1.39 cwts./ton
% Steam admission	12.0
Average top circulator temperatures ...	1,000°C.
Average combustion chamber temperatures	1,300°C.

2. Lancashire coal.

Coal carbonised—tons per retort per day	3.8

Gas volume—cu.ft. per ton of coal carbonised.	19,340
Calorific value of gas. B.t.u./cu.ft. ...	447.5
Therms per retort per day	330
Therms per ton of coal carbonised ...	86.7
Coke yield-cwt. per ton ex retort house	8.65 cwts./ton
Industrial boiler fuel-cwt. per ton ex retort house	0.90 cwts./ton
Breeze cwt. per ton ex retort house ...	1.06 cwts./ton
% Steam admission	10.0%
Average top circulator temperatures ...	990°C.
Average combustion chamber temperatures	1,295°C.

For the purpose of comparing costs, the coke yield in each case has been corrected to the moisture content of the Yorkshire coke, which was about 9%. In this connection undoubtedly the most significant feature was the increase in the amount of No. 2 coke (2 in. × 1¼ in.) compared to No. 1 (over 2 in.). The various percentages of each size made, wet, ex retort house, into bunkers, are shown in Table 4.

TABLE 4

Coal	Coke size				
	1	2	3	4	5
	%	%	%	%	%
Yorkshire ..	31·7	34·6	16·7	4·8	12·2
Lancashire ..	20·2	44·8	16·6	8·1	10·3

The ratio of the weights of Nos. 1 and 2 coke made in each case were: Yorkshire coal, 1 : 1.09, and Lancashire coal, 1 : 2.19.

The greater proportion of No. 2 coke made from the Lancashire coal is probably due to its different caking characteristics; from the proximate analysis it can be seen that the swelling number decreased from 7½ to 5½.

Misleading

Crude gas samples were collected, over a period of two hours, at the foul gas main in the retort house (this being prior to air admission). Analyses in themselves can prove to be misleading, so in order to overcome this difficulty the volumetric composition of the gas made is shown in Table 5, which shows that the ratio of $CO:CO_2$ is higher in the gas from the Lancashire coal than that from the Yorkshire. This is probably due to increased efficiency of steam decomposition by a more reactive coke.

TABLE 5

Coal	Cubic feet constituents/ton					
	CO_2	O_2	CnHm	CO	N_2	Inerts.
Yorkshire ..	855	20	450	3,380	960	1,835
Lancashire ..	755	20	450	3,750	810	1,585

The proximate analysis of the coals shows that the amount of sulphur in the Lancashire coal is 35.4% greater than that in the Yorkshire coal. Table 6 shows the percentage sulphur in the coal, the hydrogen sulphide content at inlet to purifiers and the organic sulphur content of purified gas.

TABLE 6

Coal	Sulphur in coal %	H_2S inlet purifiers. grains H_2S/100 cu.ft.	Organic sulphur grains sulphur/ 100 cu.ft.
Yorkshire ..	1·04	420	15·7
Lancashire	1·61	680	24·1

The test period was of too short a duration for any definite conclusions to be drawn as to whether increased costs of purification were to be expected, or any alterations in the frequency of purifier rotation would be needed or whether a decreased life of the oxide was likely.

In view, however, of the interest taken recently in organic sulphur removal, such a large increase in the sulphur compounds of town gas is undesirable. If, all other things being equal, the net cost of coal were the same for both types, the increase in organic sulphur content alone would cause the offending coal to be rejected.

Net cost of coal carbonised.

Yorkshire coal.

Gas therms per ton of coal carbonised	91.5
Cost of coal delivered—per ton ...	100 units
Cost of coal per therm of gas ...	1.093 units
Credit.	
Coke made at 92.86 units per ton ...	0.479 units per therm
IBF made at 72.23 units per ton ...	0.021 units per therm
Breeze made at 35.98 units per ton ...	0.027 units per therm
	0.527

∴ Net cost of coal carbonised = 1.093 − 0.527
= 0.566 units per therm.

Lancashire coal.

Gas therms per ton of coal carbonised	86.7
Cost of coal delivered—per ton ...	93.6 units
Cost of coal per therm of gas ...	1.080 units
Credit.	
Coke made at 92.86 units per ton ...	0.463 units per therm
IBF made at 72.23 units per ton ...	0.037 units per therm
Breeze made at 35.98 units per ton ...	0.022 units per therm
	0.522

∴ Net cost of coal carbonised = 1.080 − 0.522
= 0.558 units per therm.

No account has been taken of the revenue derived from the tar made, since it was impossible to obtain an accurate measurement of the tar yield over such a short period of time.

The above figures show that the net cost of coal carbonised per therm of gas made is lower in the case of Lancashire coal than that of Yorkshire. As to whether this saving is going to be offset by increased purifier charges, reduced ammonia recovery, etc., is a problem which would require further detailed investigation.

Mechanical Steel Testing

A NEW publication (B.S. 3082) dealing with determination of proof stress forms Part 1 in a series of British Standards which will deal with the mechanical testing of steel at elevated temperatures. It is based on the work undertaken by Technical Committee 17 (Steel) of the International Organisation for Standardisation as tentatively approved by all the member countries represented. Copies can be obtained from 2, Park Street, London, W.1. Price 3s. (Postage extra to non-subscribers.)

From a paper to the Manchester and District Junior Association of Gas Engineers, Liverpool, December 10, 1958

Trunk Feeding at Hyde Works

By R. S. COATES,
STOCKPORT WORKS, NORTH CHESHIRE GROUP,
NORTH WESTERN GAS BOARD.

THE carbonising plant at the Hyde works consists of both upward and downwardly heated Woodall-Duckham continuous vertical retorts. There are two benches, consisting of 12 upwardly heated 62-in. continuous vertical retorts in one bench, and 16 downwardly heated continuous vertical retorts with recuperators in another bench, comprising 12 57½-in. retorts in three beds of four and one bed of four 62-in. retorts. The total capacity is about 3 mill. cu.ft. per day. All the retorts are fitted with the normal coal deflecting plates.

For a considerable time, trouble had been experienced with irregular coal travel and the 'hanging up' of retorts. So bad had the trouble become that the hourly schedule of rodding all retorts was not effective in keeping the charges moving, and excessive time had to be spent in freeing many of the charges. Large volumes of gas too, were clearly being vented to atmosphere. Much thought was given to the problem, and it was decided to fit a trunk feed in an attempt to cure the trouble.

A very simple trunk was devised, made entirely of $\frac{3}{16}$ in. mild steel plate, except for the removal hooks which were of $1\frac{1}{4}$ in. by $\frac{5}{16}$ in. black flat bar. It was of all welded construction. Three trunks made out of one 6 ft. by 3 ft. by $\frac{3}{16}$ in. sheet of mild steel can be fabricated by the blacksmith in about eight hours.

The total cost per trunk is 46s. 1d. made up as follows: Cost of material for three trunks, one sheet of 6 ft. by 3 ft. mild steel at 5s. 6d. per sq. ft., 99s.; blacksmith's time, eight hours at 4s. 11d. per hour, 39s. 4d.; this gives a total cost of 138s. 4d.; cost per trunk, 138s. 4d./3 or 46s. 1d.

Cost per Therm

The total cost for the whole 28 retorts would then be about 1,290s. Assuming a trunk life of three years, the cost per therm of gas made is .0016d.

An isometric drawing of a trunk, included with the paper, showed that it was designed to be supported by the coal deflector plates by means of extensions at its top, and two plates were welded at right angles on the side opposite to the feed to maintain it in a vertical position by supporting it against the retort brickwork. The design was such that the coal was kept clear of the top ironwork of the retort. This probably has some bearing on the better coal travel obtained. Two hooks were provided at the top, so that during the scurfing of the retort, the trunk could be easily removed and was not, therefore, subjected to the oxidising current of air drawn in to burn off the scurf, and to excessive temperatures. This feature has done much to prolong the life of the trunk. The first trunks were fitted at Hyde in April, 1957 (19 months ago) and are not yet showing any appreciable signs of wear. When the trunk is removed from the retort before scurfing, the outside is coated with scurf which is easily chipped off. Occasionally it has been found that the heat has slightly buckled the trunk, but they are easily straightened out by the works blacksmith, apparently with no detrimental effects.

Total Extension

Fig. 1 shows the trunks as fitted to the retort and gives a good idea of the effect it has had on the coal feed and on the free gas space at the top of the retort; it also shows the total extension into the retort. Clearly this should be the minimum possible to cure the trouble, since an excessively long trunk would reduce the total charge in the retort far below that under normal working conditions. This would not be desirable and would increase the free gas space above the charge with the

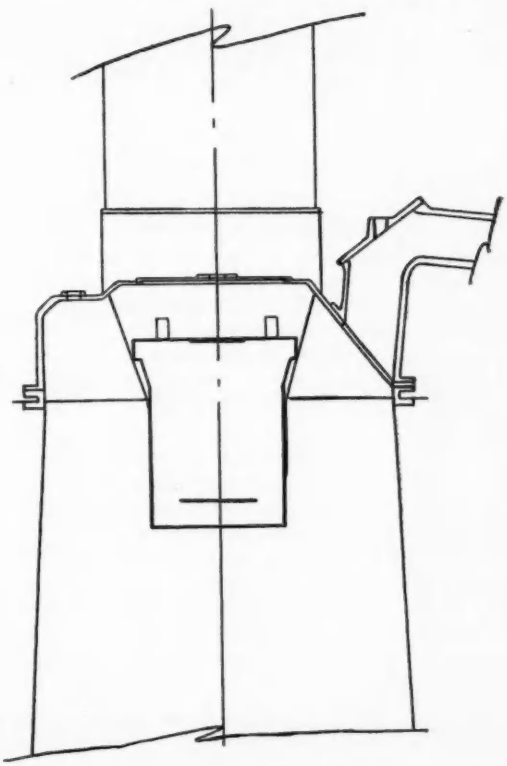

Fig. 1. General arrangement of retort top ironwork

tendency to overcrack the gas. It was decided to make the extension about 1 ft. longer than the long coal deflector plate. No other extensions were tried since it was soon evident that this one was suitable. The total extension is about 3 ft. measured from the top of the coal deflector plates, or 10 in. longer than the long coal deflector plate on the offtake side. In this way the coal covers the full area of the retort at least 10 in. lower down than when a normal coal feed is employed. The last retort was fitted with trunks early in June, 1957, and it was soon obvious that they had effectively cured the trouble.

Since then it has only been on very rare occasions that trouble has been experienced with any of the retorts 'hanging up,' whereas previously it was an all too frequent occurrence. No routine rodding is now carried out and the coal boxes are filled each hour. A retort is only rodded if it has not taken a normal charge of coal. This is all that is now necessary. The trunks seem to have prevented all adherence to the retort walls.

The effect of easing the burden of the top stoker was immediately obvious and labour turnover is now an absolute minimum. Prior to the fixing of the trunks, a top stoker had a maximum of 18 retorts under his charge —Union agreement—which meant that two men per shift were required for top stoking duties. One man had to look after 18 retorts while the other had to look after any surplus up to ten retorts, and to make up his duties he had to be given other jobs to do. When the effects of the trunks had been proved, negotiations were successful in making the whole 28 retorts the responsibility of one top stoker. This meant that instead of there being seven men to cover the top stokers' duties, only four men are now needed. The saving in wages amounts to a total of £2,500 per annum, a considerable sum for a small undertaking like Hyde, and represents about .2d. per therm of gas made, or 18.5d. per ton of coal carbonised.

Basis for Comparison

A graph included in the paper showed the effects the trunk feed has had on gas production per ton of coal carbonised. The figures were taken for a period of six months up to June, 1957, before all the retorts were fitted with trunks, and for a further six-months period immediately afterwards. For this particular 12-months period, the Hyde works was carbonising only coal from the North East Division of the National Coal Board, so it affords a good basis for comparison. The average yield per ton of coal carbonised has increased from the time when all the retorts were fitted with trunks. This is obviously a direct result of the improved conditions of coal travel through the retorts and the decreased volume of gas now vented to atmosphere since routine rodding is no longer practised as under the former conditions of operating. The average yield in therms per ton over the first six-months period was 89.23, and over the latter six-months period 92.67. This average increase of 3.44 therms per ton alone warrants the fitting of the trunks.

There was a slight difference in the analysis of the gas being made after fitting the trunks. This is shown in Table 1.

Another graph showed the tar yield in gal. per ton of coal carbonised cover the same period. A fall in the tar make took place when all the retorts were fitted with trunk feeds. This was expected and is a direct result of increasing the free gas space which has altered the cracking conditions at the top of the retort. The tar yield fell from an average of 16.99 gal. per ton of coal carbonised to 14.73 gal. per ton. However, the latter figure approximates closely to what could be considered a good tar yield under ideal carbonising conditions (about 15 gal. per ton of coal carbonised). This infers that there is no over-cracking taking place but that cracking conditions are probably better now than they were formerly.

TABLE 1

	CO_2 %	O_2 %	CnHm %	CO %	CH_4 %	H_2 %	N_2 %
Before fitting	3·3	0·8	1·5	15·8	20·0	47·1	11·5
After fitting	4·0	0·6	1·6	16·1	19·5	48·2	10·0

Typical gas analyses.

The loss in revenue caused by the decrease in tar yield is almost negligible compared to the benefits obtained. This loss at about 3.9d. per ton of coal carbonised bears no comparison with the saving of 18.5d. in wages, and the extra 3.5 therms per ton obtained from improved operating conditions, equivalent to about 70d., making a total of 88.5d. per ton of coal carbonised. The tar loss is only 4.4% of this total.

Increases Effectiveness

It is probable that since the coal has been subjected to fairly high temperatures as it nears the base of the trunk, that some degree of coalescence has taken place which will tend to increase the angle of repose of the coal. This increases the effectiveness of trunk feeding still further, because the coal only covers the full area of the retort at the base of its angle of repose. This gradual tapering out to fill the whole area of the retort is most likely one of the causes of better coal travel. But it is done at the risk of increasing the free gas space which can have a detrimental effect on the gas quality by overcracking. The tar yields, however, indicate that no overcracking is evident in this particular case. A general survey shows that the trunk feeds were well worth fitting. They are cheap, easily made, easily fitted and removed, have a prolonged life, and have done the job expected of them. There is no evidence which shows they are any detriment to the working life of the retorts.

Printers' Year Book

AN informative book of interest to those who produce magazines or other printed matter in industry is the Modern Printers' Year Book and Directory of Suppliers, published recently by Bendles (Torquay) Ltd.

This, the 1959 edition, gives information regarding the composition, make-up, type specimens, block calculations, measures of printing papers, and, in fact, practically everything a printer or prospective printer requires. Easily read, and brim-full of facts and figures, the book costs 5s.